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Clinical pharmaceutical services in Bundeswehr Hospitals – a mixed-methods analysis

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Received August 15, 2022, accepted September 11, 2022

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Pharmazie 77: 352-358 (2022) *doi: 10.1691/ph.2022.2492*

Background and aim: Clinical pharmaceutical services (CPS) have a proven benefit. A mixed-methods analysis was performed to investigate which CPS are currently implemented in all Bundeswehr hospitals and how those CPS are prioritized. *Investigations: (i) Qualitative approach:* CPSs were defined based on focus group interviews with clinical pharmaceutical representatives from Bundeswehr hospitals. *(ii) Quantitative approach:* A questionnaire was created based on the CPS defined. The questionnaire was used in structured individual interviews in the focus group. The interview addressed benefits, barriers, initiators, implementation, prioritization, and resources for CPS. *Results: (i) Qualitative approach:* Altogether, 162 CPS were defined. *(ii) Quantitative approach:* "Clear evidence of benefit" was the most frequently reported benefit. "Structural aspects" was the most frequently mentioned barrier. The pharmacy department mainly initiated CPS. In admission, CPS were implemented with a median level of "0" ("0"=none to "4"=full implementation) and prioritized with a median level of "3" ("0"=none to "4"=highest priority), during inpatient care/hospitalization with "3" vs. "3" and in "discharge" with "2" vs. "2". CPS in "critical care", "surgical medicine", and "internal medicine" where implemented with "4", "4", and "0" and prioritized with "4", "3", and "3". From a median of n=9 personal resources per hospital, n=3 were located in CPS with n=1 exclusively in the units. Apart from "therapeutic drug monitoring" only databases were mentioned as required material resources. *Conclusions:* In a mixed-methods analysis, we defined CPS and had a clinical-pharmaceutical focus group evaluate those CPS comparing the current implementation and their prioritization. Numerous CPSs were identified that were not adequately implemented based on their prioritization.

1. Introduction

In recent years, a number of studies have demonstrated the benefits of clinical pharmaceutical services (CPS) in terms of patient- and quality-oriented parameters (Carter 2016). CPS are defined in the literature (Semerjian et al. 2019) as all services provided by clinical pharmacists in which drug-related problems have been identified and interventions proposed to resolve them in a multi-professional team. With this objective, this can extend from admission (Guo et al. 2020) to discharge (Bonetti et al. 2018) and also covers seamless care activities at interfaces of patient care (Edwards et al. 2014). All areas of hospital care can be addressed up to highly specialized inpatient care such as intensive care units (Bertsche et al. 2010). This can range from patients with chronic diseases (Gorgas Torner et al. 2012) to those with acute illnesses presenting to the emergency department (Morgan et al. 2018). It can include activities on the ward (English et al. 2020), but also in the back office such as drug information services (Kim et al. 2020). It can be used for both internal (Lombardi et al. 2018) and surgical medicine (Jarfaut et al. 2013). Interfaces with other hospital pharmacy tasks should also be considered, e.g. patient-oriented services in the area of therapeutic drug monitoring (Imai et al. 2020) and oncology (Oliveira et al. 2021). However, the question arises which of those numerous CPSs have actually been implemented so far in our setting of the Bundeswehr Hospitals. What were the benefits and barriers to the implementation of such services? What resources are needed? For this purpose, CPS should be prioritized for a sustainable implementation. We therefore defined and analyzed CPS by a mixed-methods analysis combining qualitative und quantitative approaches in Bundeswehr Hospitals.

2. Investigations and research

2.1. Participants and setting

We invited all heads of pharmacy departments and CPS unit leaders of the pharmacies of the Bundeswehr Hospital in Germany to participate as experts of a focus group. The participation was voluntary and the analysis of the data was anonymized. The confidentiality of all information provided has been agreed. Data acquisition was performed from October 21th to December 6th, 2021.

2.2. Ethical considerations

No personal- or patient-related data were collected or evaluated as part of this publication. Only voluntary surveys of pharmacists as members of a clinical-pharmaceutical focus group were conducted and documented anonymously. An ethics vote is not required for this, in accordance with legal requirements. The consent of the data protection officer of the Koblenz Medical Command was obtained.

2.3. Qualitative approach (i)

Two of the authors (LR and TB) defined a structure of main categories and subcategories of CPS based on the literature and three focus group interviews. The categories and definitions were peer-reviewed by a third author (PM). Additional categories were possible according to the respondents' assessment in free text answers.

2.4. Quantitative approach (ii)

2.4.1. Creating a questionnaire

Two of the study authors (LR and TB) created a questionnaire for a quantitative analysis based on the predefined CPS. The questionnaire was peer-reviewed by a third author (PM). The questionnaire consisted of the following items:

- *Sociodemographic data:* We asked about work experience in years overall, in the hospital, and in jobs designated as CPS.
- *Benefits, barriers, and initiators:* The benefits and barriers for and against the implementation of CPS as well as initiators of CPS were asked by means of a multiple choice and, if necessary, supplementary free text answers.
- *Implementation:* The participating experts were invited to assess the current or former implementation of CPS. The participants were asked: "With what implementation level would you rate the practically offered CPS category?" The answers should use the following five levels (0-4) for the status-quo of implementation: Level 0: Not yet offered anywhere. Level 1: Offered in the past and now discontinued. Level 2: Currently offered on a rudimentary basis. Level 3: Currently offered for selected units, but not yet offered in all units. Level 4: Currently offered across the board in all relevant units.
- *Prioritizing:* The respondents were invited to prioritize the CPS in respect to their importance for use. Participants were asked: "With what priority level would you rate the CPS for the need to be practically offered? This can be done whether or not they have already performed it." The answers should use the following five levels (0-4) for priority: Level 0: Not useful. Level 1: Lowest relevance. Level 2: Lower relevance. Level 3: Higher relevance. Level 4: Highest relevance.
- *Resources:* The experts were asked about the resources answering the question: "What resources would you need to start the relevant service from scratch in your organization, or which have been already required for its implementation?" Answers can be given in values for staff or in free text for other resources.

2.4.2. Structured expert interviews to assess CPS

The structured interviews of all experts of the focus group were based on the categories of the questionnaire with multiple answers possible. An individual appointment was made with the participants for the interview after they had given their consent to participate via video conference (performed by *Cisco Webex*™). One week before the appointment, the questionnaire together with the definitions of the CPS categories were sent to the experts as an electronic document for completion. This was to serve as the basis for the interview. The interview appointments were scheduled for two hours. During this time, all question categories were discussed. For objectification, the information in the questionnaires, which addressed objective aspects such as implementation and resources, was compared to the data available in the Bundeswehr Medical Service. Possible discrepancies should be addressed in the interview. During the interview, open questions could be asked about individual aspects and additional information could be provided. These were documented by the interviewers (LR, TB) and then sent back to the interviewed experts with the request to return it within one week. If the questionnaire was not returned in time, reminder emails were sent as many times as it took to get the questionnaire back (max. two times was required).

2.5. Data analysis

A descriptive data analysis was performed. Data are presented either as sums (number of yes answers) for dichotomous data (yes/no) or as medians with 25% (Q25%) and 75% (Q75%) quartiles for ordinal data. The data analysis was performed by *Excel* 2019 *for Windows*.

2.6. Sociodemographic characteristics of the focus group

All invited experts of the focus group (10 from n=10) took part (response rate: 100%). Participants had a total professional experience of a median of 25 years (Q25%/Q75%: 21/33 years), an experience in a hospital pharmacy of 18 years (Q25%/Q75%: 12.25/20 years), and an experience in CPS of 4 years (Q25%/Q75%: 4/6 years). Two of the participants were female.

2.7. Results qualitative approach (i)

The following ten main categories were predefined: (1) Admission management. (2) Medication management during hospital stay. (3) Discharge management. (4) Drug information. (5) Interfaces. (6) Activities in committees. (7) Special clinical pharmaceutical services (e.g. therapeutic drug monitoring). (8) Education and training. (9) Quality assurance, and (10) Others. 157 subcategories had been defined. In Category 10 (others allowing free-text reporting), 5 additional categories were reported resulting in a total of 162 subcategories. All subcategories are shown in Appendix 1.

2.8. Results quantitative approach (ii)

2.8.1. Benefits

"Clear evidence of benefit" was cited by all the ten experts of the focus group for the introduction of CPS. N=8 of answers addressed that "Specific clinical expertise of pharmacist" spoke in favor of CPS, and n=7 were chosen for "Knowledge at interfaces with medicine" qualified them for this. For the benefit, the other categories were rated as follows: "Open up new tasks on ward" (n=6), "Pharmacist can look from 'outside'" (n=5), "Knowledge from studies on CPS" (n=3), and "Enough staff available" (n=2). Economic aspects such as cost savings by CPS were mentioned once (n=1).

2.8.2. Barriers

"Structural aspects" were most frequently cited as barriers to CPS implementation (n=6). In second place, with n=5 of the responses, were "Physician acceptance problems", and in third place, with n=4 each, were "Not enough staff" and "Lack of time resources". "Number of employees not sufficient" and "Lack of time resources" were rated with n=4 each. "Job key is missing" were rated with n=3 and "Nursing acceptance problems" with n=2. Acceptance problems from the pharmacy (n=1) or supervisor (n=0) ranked last.

2.8.3. Initiators

Most projects were (co-)initiated by either pharmacy management (n=9) or pharmacy staff (n=8). N=6 respondents reported that their projects were initiated by a superior authority, n=4 by senior physicians, n=3 by the medical director, n=3 that projects had been initiated by physicians on the ward, and n=2 by the nursing staff.

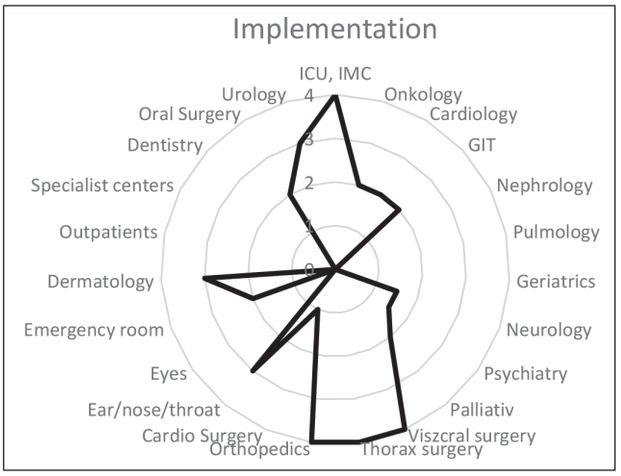

Fig. 1A: Implementation of CPS in different departments. A clinical-pharmaceutical focus group assessed the status-quo of implementation considering the following five levels (0-4): Level 0: Not yet offered anywhere, Level 1: Offered in the past and now discontinued, Level 2: Currently offered on a rudimentary basis, Level 3: Currently offered for selected units, but not yet offered in all units, and Level 4: Currently offered across the board in all relevant units.

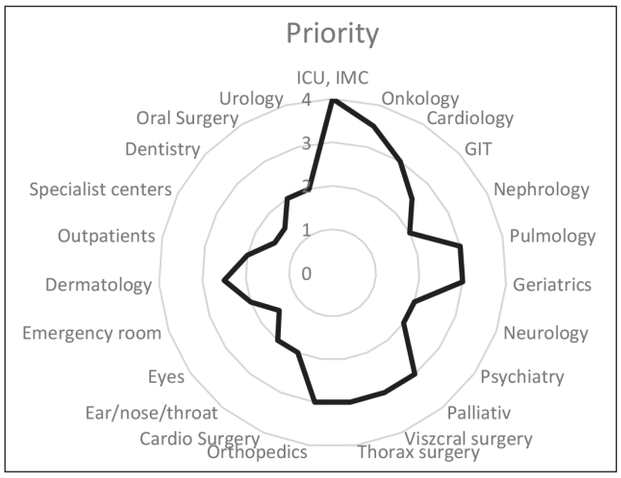

Fig. 1B: Prioritization of CPS in different departments. A clinical-pharmaceutical focus group assessed the priority for implementation of CPS considering the following five levels (0-4): Level 0: Not useful at all, Level 1: Lowest relevance, Level 2: Lower relevance, Level 3: Higher relevance, and Level 4: Highest relevance.

2.8.4. *Implementation*

In admission, CPS were implemented with a median level of "0". During inpatient care/hospitalization, CPS were implemented with a median level of "3". In discharge, CPS were implemented with a median level of "2". CPS in critical care and surgical areas were implemented with 4 (Figs. 1A and 2A) and in internal medicine with "0". Ear/nose/throat, dermatology, and urology were implemented with each "3". The oncology departments achieved an implementation of "2". Drug information measures for physicians, nurses, and patients have already been implemented comprehensively at all sites ("4") apart from those offered only for patients ("3.5") relatives ("0") and other professional groups than pharmacists ("0"). A dedicated patient counseling room was rarely provided ("1"). Commission activities were implemented quite comprehensively ("4"). In the area of education and training, pharmacy trainees were most frequently trained in the hospitals (each "4"). All hospitals offered training in clinical pharmacy ("4"), but none offered training in drug information and medication management (both "0"). Special cross-sector offerings, including also outpatients, had not been implemented so far ("0").

2.8.5. *Prioritizing*

In admission, CPS were prioritized with a median level "3". In inpatient care/hospitalization, CPS were prioritized with "3". In discharge, CPS were prioritized with "2". In critical care, CPS were prioritized with a median level "4" and in surgical areas with "3" (Figs. 1B and 2B). Internal medicine units, e.g. pulmonology, were prioritized with "3". Ear/nose/throat, dermatology, and urology were prioritized with "2"; "2.5"; and "2". The oncology departments achieved a particularly high priority of "3.5". Drug information was given a high priority for physicians and nurses (each "3") as well as for patients and relatives (each "3"). Therapeutic drug monitoring (TDM) was prioritized with a high to highest level ("2" to "4" depending on the drug). Commission activities were prioritized with "4". In the area of education and training, the focus of priority was on the qualification of pharmaceutical technical assistants and pharmacy trainees (each "4"). Quality assurance measures such as CIRS (*Critical Incident Reporting Systems*) or proficiency testing at TDM was given highest priority ("4").

2.8.6. *Resources*

From a median of n=9 pharmacy positions per hospital, n=3 were placed in CPS units and n=0.5 were exclusively in units. For pharmaceutical technical assistants, the median total number of positions was n=13, for CPS it was n=1.5, and for ward-only jobs

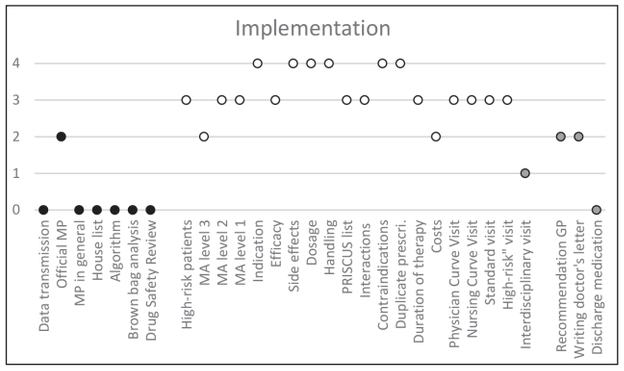

Fig. 2A: Implementation of CPS from admission to discharge. Comparison of different subcategories at admission (first block), during inpatient care/hospitalization (second block), and at discharge (third block) in the assessment with regard to implementation. Abbreviations: MP – medication plan, MA – medication analysis.

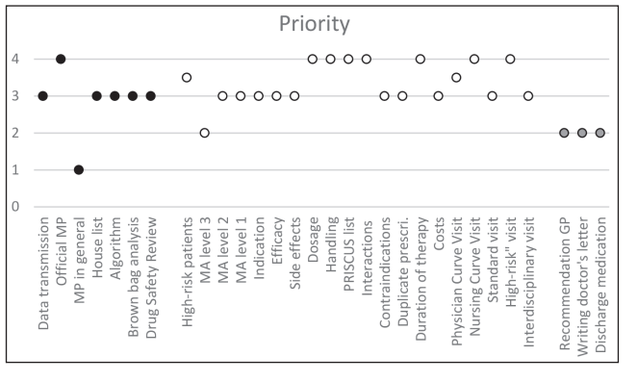

Fig. 2B: Prioritization of CPS from admission to discharge. Comparison of different subcategories at admission (first block), during inpatient care/hospitalization (second block), and at discharge (third block) in the assessment with regard to priority. Abbreviations: MP – medication plan, MA – medication analysis.

it was n=0. Resource requirements for current or future implementation were reported for most of the sub-categories with shares of a single position (pharmacists and pharmaceutical technical assistants). Resources in terms of technical equipment mostly related to hardware and software. Interaction databases played a special role in this regard. Only in the case of TDM was additional analytical equipment mentioned.

No discrepancies occurred between the information provided in the questionnaire and objectifiable information at Headquarters.

3. Discussion

3.1. Considerations on the main findings

This study provides, for the first time, an overview over current implementation and prioritization of CPS in Bundeswehr Hospitals and also reports on barriers and lack of implementation of some highest prioritized CPS at the different sites. Using a mixed-methods analysis combining qualitative and quantitative methods, CPS have been already comprehensively implemented so far specifically where they were also highly prioritized. However, we found also areas, such as admission, where priorities were set high but practical implementation still lagged behind. An important result was also that considerable networking of CPS with other areas of pharmacy was highly prioritized in general. This is particularly relevant since pharmacists and pharmaceutical technical assistants were still comparatively rarely located directly in areas of drug administration close to the patient.

The experts reported a high priority for sustainable implementation, especially in areas that had already been implemented to a large extent. It is interesting that the high evidence for CPS was considered as the most important reason for implementation. The

most common barrier in the implementation of CPS were structural aspects. CPSs were mostly initiated from either the management or the staff of the pharmacy department.

3.2. Participants and setting

The setting of Bundeswehr Hospital provided a particularly good situation for a nationwide exemplary survey. In recent years, CPS concepts as used in civilian hospitals have also been introduced in the pharmacies of the Bundeswehr Hospitals. This was done on the principle that soldiers should receive the same medical care as civilian patients. In addition, a considerable number of civilian patients are also treated in those hospitals – also for training purposes for the physicians and nursing staff. However, CPS studies in the military pharmacy setting have been rarely performed so far (Evans et al. 2016), although this setting can serve as a good scientific model for CPS implementation. These experienced colleagues care for a wide range of patients in their hospitals and cover the area of Germany in a representative way (Berlin, Hamburg, Koblenz, Quakenbrück, Ulm, Westerstede). In addition, the Bundeswehr Hospitals have a special training mission. Thus, they also serve as multipliers for CPS and can serve as a particularly representative model for the analysis of CPS. In this context, the present project was the first to conduct a systematic status-quo analysis of CPS implementation using a mixed-methods methodology in this setting. The high level of professional experience indicates the expert status of the respondents. Although the number of pharmaceutical experts surveyed was limited but quite usual for a qualitative survey, they represented all Bundeswehr Hospitals with a response rate of 100%.

3.3. Comparison of implementation to prioritization

Interesting results revealed by the comparison of the implementation and prioritization. Here, we received different fields of interest regarding the addressed departments: (1) Departments in which CPS were considered as highly implemented and which were highly prioritized for CPS, e.g. ICU/IMC. (2) Departments in which CPS were not seen highly implemented but which were highly prioritized for CPS, e.g. geriatrics. (3) Departments in which CPS were highly implemented but which were not highly prioritized for CPS, e.g. surgery. (4) Departments in which CPS were not highly implemented and which were not highly prioritized for CPS, e.g. outpatients.

What is more, the course of treatment is another interesting aspect for a comparison of implementation and prioritization: on admission the implementation rate was considered to be low while the prioritization was rated as high. During the hospital stay and on discharge implementation, in contrast, the implementation rate was rated as high fitting well with a high prioritization.

3.4. Comparison of our main findings to the literature

A review by Rotta et al. (2015) highlights that CPS are more meaningful when the intervention is well-defined and the outcomes measured is clear and tangible. Broad goals and monitoring parameters that were unclearly defined or inconsistently assessed across studies were found to be unfavorable for demonstrating benefit. This underlines the need to define and to characterize CPS, which is precisely what we did within the present study.

Another work (Onozato et al. 2020) highlights that future studies on the influence of implementation phases, interrelationships among implementation factors, and strategies to overcome obstacles could accelerate the successful adoption of CPS. In this regard our prioritizing can be helpful for future decisions what CPS should be implemented or be sustainably extended in an environment with limited resources.

In this context it should also be emphasized that economic outcomes should also be considered as reported by Mi et al. (2020) and Touchette et al. (2014). In our survey, however, economic aspects such as cost savings were only comparatively rarely seen as an important argument in favor of CPS.

While structured investigations on all possible CPSs similar to ours are rare in the international literature, they do exist: A very similar design compared to ours was chosen by Trinh et al. (2018). They described the services, and explored barriers and facilitators in implementing CPS in hospitals. As we did, they performed a mixed methods study investigating qualitative and quantitative data by using an online questionnaire and in-depth interviews. In contrast to our design, they focused on workforce, policies, and clinical pharmacy activities. By doing so, they found that 87% of hospitals had established clinical pharmacy teams while patient-specific CPS were available only in 21%. Among the most common non-patient-specific activity was providing medicines information (97%) which was also a very broadly used CPS in our setting. A specific point that differed from our results was that the patient specific activities varied widely between hospitals. However, in our setting, the CPS practiced did not usually differ significantly from hospital to hospital indicating certain centralized specifications by the Headquarters. The lack of qualified pharmacists was reported by Trinh et al. (2018) as an important barrier. However, this contrasts with our results, which generally did not perceive this as a relevant barrier.

In an update by the same group (Dong et al. 2022) they received a response rate of 41% contrasting the 100% in our study. Here, the authors reported activities such as medication counselling, monitoring of adverse drug reactions, and obtaining patient's medication histories. Those activities were provided in 49% to 57% of the hospitals which were considerably lower than non-patient oriented CPS in this survey. Although basic tasks such as in drug information had highest implementation rates and highest priorities in our setting as well, immediate patient-centered tasks such as medication analysis were also rated with the highest implementation rates and priorities.

Abousheishaa et al. (2022) described pharmacists' perceived barriers which include – among others – lack of time (89%), lack of pharmacy staff (87%), patients' inability to understand medical information (85%), insufficient patient demand and acceptance (82%), and physicians' inadequate recognition of pharmacists' skills (76%). This coverage in this article must be appreciated as very comprehensive and offers some additional aspects that were not mentioned in our interview – not even actively in the free text.

3.5. Outlook and consequences of the study results

The present findings should serve, firstly, to document the possibilities and facets of CPS and also to communicate them more transparently to the medical and nursing staff in our setting. Secondly, in a next step, those groups will also be asked what priority they attach to the various CPS and which of them they would like to see implemented in their own departments. Third, based on all those findings, a decision will be made as to which (highest-priority) CPS should be offered on a sustainable basis in all Bundeswehr hospitals or, if appropriate, only in specific hospitals or departments. In this context, resource allocation will be of particular importance. In this way, precisely defined CPSs are to be established as a permanent offering.

3.6. Limitations

This study has the following limitations: (i) When drawing conclusions from the results, it should be kept in mind that only a comparatively small number of hospitals were included in the total. (ii) When assessing generalizability, it should be noted that – even though a response rate of 100% was achieved – this was an internal study that focused exclusively on the environment of Bundeswehr hospitals. (iii) The study did not directly examine the benefits, barriers, and implementation of CPS. it only evaluates and describes the interview-based report on these points. However, objectifiable information such as resources was verified against the headquarters data and no discrepancies emerged from this process.

3.7. Conclusion

In this mixed-methods analysis, we defined an impressive number of a total of 162 subcategories for CPS based on a focus group analysis. We involved a focus group consisting of experts from Bundeswehr Hospitals to investigate benefits, barriers, initiators, implementation, prioritization, and resources for CPS. Despite structural hurdles, the experts rated the clear benefit of CPS as the main argument for implementation. Most of CPS were implemented by pharmacies. The focus regarding implemented services was on inpatient care rather than at the interfaces such as admission. Critical care and surgical fields were in the focus of implemented CPS.

Acknowledgements: We would like to thank the Koblenz Medical Command and the Bundeswehr Hospitals for their support of the survey.

Funding: No third-party funds were raised for this project.

Conflicts of Interest: The authors have no relevant financial or non-financial interests to disclose.

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Appendix 1:

Implementation and Prioritizing of in total 162 subcategories of clinical pharmaceutical services (CPS). From those, 157 subcategories of CPS were predefined based on literature and professional experience. Median of an assessment by a focus group consisting of head of pharmacy departments and CPS subgroup leaders of the Bundeswehr Hospitals are presented. The answers should use the following five Levels (0-4) for the status-quo of implementation. Level 0: Not yet offered anywhere. Level 1: Offered in the past and now discontinued. Level 2: Currently offered on a rudimentary basis. Level 3: Currently offered for selected units, but not yet offered in all units. Level 4: Currently offered across the board in all relevant units. The answers should use the following five levels (0-4) for priority. Level 0: Not useful. Level 1: Lowest relevance. Level 2: Lower relevance. Level 3: Higher relevance. Level 4: Highest relevance.

Subcategory	Implementation	Prioritizing
1 Admission management		
1.1 Data transmission upon admission	0	3
1.2 Federal medication plan (Federal Medication Plan)	2	4
1.3 Other medication plan used	0	1
1.4 Conversion of outpatient medication to home list	0	3
1.5 Conversion of home list according to algorithm	0	3
1.6 Drug safety check on admission incl. brown bag	0	3
1.7 Drug safety check on admission without brown bag	0	3
1.8 Others	0	3
2 Medication management during hospital stay		
2.1 Co-care for high-risk patients	3	3.5
2.2 Carrying out a medication analysis (MA)		
2.2.1 Comprehensive MA Level 3	2	2
2.2.2 Extended MA Level 2	3	3
2.2.3 Simple MA Level 1	3	3
2.3 MA for indication	4	3
2.4 MA for efficacy	3	3
2.5 MA for adverse effects	4	3
2.6 MA on dosage, dose interval, duration of therapy	4	4
2.7 MA on intake and handling	4	4
2.8 MA on appropriate medication of particular patient	3	4
2.9 MA on drug/food interactions	3	4
2.10 MA on contraindications	4	3
2.11 MA on duplicate prescriptions	4	3
2.12 MA on duration of therapy	3	4
2.13 MA on less expensive alternative	2	3
2.14 Physician curve rounds	3	3.5
2.15 Nursing curve rounds	3	4
2.16 Ward rounds (all patients)	3	3
2.17 Ward rounds (only “high risk” patients)	3	4
2.18 Interdisciplinary ward rounds	1	3
2.19 Others	0	0
3 Discharge management		
3.1 Recommendation for troop physician/low-reg. physician	2	2

3.2 Participation in writing the physician's letter	2	2
3.3 Discharge medication to patients (incl. consultation)	0	2
3.4 Others (handing out Federal Medication Plan)	2	4
4 Drug information		
4.1 Inquiry/response database.	2	3
4.2 four-eyes control of responses	2	3
4.3 Evaluation of response by users	1	2
4.4 Type of response		
4.4.1 Drug information verbally	2	3
4.4.2 Drug information in writing (by email)	1	1
4.4.3 Drug information in writing (by letter)	0	1
4.4.4 Drug information in writing (by email)	3,5	4
4.4.5 Drug information in writing/orally	3	3
4.5 Standardized information and advice for physicians and nursing staff on drugs and medical devices		
4.5.1 Pharmacy Newspaper	1	1,5
4.5.2 Newsletter	4	2
4.5.3 Local Drug Committee contributions	4	4
4.5.4 "Red Hand" letters	4	4
4.6 Individual information and advice on medicinal products and medical devices		
4.6.1 Drug information for physicians	4	3
4.6.2 Drug information for nursing	4	3
4.6.3 Drug information for doctors AND nursing staff	4	3
4.6.4 Drug information for patients	3,5	3
4.6.5 Drug information for relatives	0	3
4.6.6 Drug information for other professions	0	2
4.7 Information and counseling of patients about drug therapy		
4.7.1 Patient consultation room available	1	2
4.7.2 Patient can call pharmacist	4	1.5
4.7.3 Admission: patient information/counseling available	0	2.5
4.7.4 Course of treatment: patient information/counseling	0	2
4.7.5 Discharge: patient information/advice	0	3
4.7.6 Patient information in foreign languages	0	2.5
4.7.7 Patient information events	0	2
4.7.8 Patient information flyers, press work	0	2.5
4.7.9 Patients in FU units/outpatients	0	2
4.7.10 Patients in day clinic	0	2
4.7.11 Patient feedback	0	1
4.8 Others	0	0
5 Interfaces		
5.1 Medical areas for which services are offered		
5.1.1 Intensive care and intermediate care units (ICU, IMC)	4	4
5.1.2 Hematology and Oncology	2	3.5
5.1.3 Internal Medicine: Cardiology	2	3
5.1.4 Internal Medicine: Gastroenterology	2	2.5
5.1.5 Internal Medicine: Nephrology/Endocrinology	0	2
5.1.6 Internal Medicine: Pulmonology	0	3
5.1.7 Geriatrics	0	3
5.1.8 Neurology	1.5	2
5.1.9 Psychiatry/Mental Health	1.5	2
5.1.10 Palliative medicine/pain therapy	2	3
5.1.11 Operative medicine: Visceral surgery	4	3
5.1.12 Operative medicine: Thoracic surgery	4	3
5.1.13 Operative medicine: Trauma surgery/orthopedics	4	3
5.1.14 Operative medicine: Cardiovascular surgery	1	2
5.1.15 Otorhinolaryngology	3	2
5.1.16 Ophthalmology	0	1.5
5.1.17 Emergency Department	2	2
5.1.18 Dermatology and Allergology	3	2.5
5.1.19 Interdisciplinary Day Clinic	0	2
5.1.20 Specialized examination centers	0	1.5
5.1.21 Dentistry	0	1.5
5.1.22 Oral and maxillofacial surgery	2	2
5.1.23 Others: Urology, Intensive Care Transport, general Practitioner (GP)	3	2
5.2 Consumption analyses	3.5	3
5.3 Pharmacoeconomic analyses/budget planning	1	3
5.4 Oncology consulting	4	3
5.5 Clinical studies	0	2.5
5.6 Therapeutic Drug Monitoring (TDM)		
5.6.1 TDM: betalactams	2	4
5.6.2 TDM: linezolid	0	3
5.6.3 TDM: aminoglycosides	0	3
5.6.4 TDM: azoles	0	3
5.6.5 TDM: anticonvulsants	4	4
5.6.6 TDM: Others (vancomycin)	1	2
5.7 Wound management	0.5	2
5.8 Stoma care	2	2
5.9 Advice on enteral/parenteral nutrition	1	2
5.10 Advice on other nutrition	2	4
5.11 Review of drug supplies on ward	4	4
5.12 Closed-loop and unit-dose concepts	0	4
5.13 Electronic prescribing/knowledge support	0	4
5.14 Telepharmacy	0	2
5.15 Sound alikes/Look alikes	3	3
5.16 Cross-sector approaches to drug usability		
5.16.1 Cross-sector civilian patients	0	1.5
5.16.2 Cross-sector military patients	1.5	3
5.17 Documentation of drug therapy	4	4
5.18 Risks of medicinal products and medical devices – measures of pharmacy	4	3
5.19 Others	4	4
6 Activities in committees		
6.1 Drug Committee	4	4
6.2 Drug safety Committee	2	4
6.3 Hygiene Committee	4	4
6.4 Transfusion Committee	4	3.5
6.5 Expert Committee	3	3
6.6 Antibiotic stewardship team (ABS team)	4	4
6.7 Critical Incident Reporting System (CIRS) analysis	4	3.5
6.8 Point-of-Care Monitoring	0	2
6.9 Others	0	0
7 Special clinical pharmaceutical service		
7.1 Probability, divisibility, and mortability of drugs.	4	3
7.2 Compatibility testing of drugs	4	3
7.3 Others	0	0
8 Education and training		
8.1 Regular internal hospital training courses	4	3
8.2 Continuing education of pharmacy staff internally	2	3
8.3 Training rounds	3	3
8.4 Pharmaceutical commercial employees	3	2.5
8.5 Pharmaceutical technical assistants	3.5	4
8.6 Pharmacists in practical training	4	4
8.7 Famulants	1.5	3
8.8 Sanitary Officers Pharmacists Education and training	1.5	2
8.9 Medical Sergeants (Material) Education and training	0	2
8.10 Medical Sergeants (Pharmaceutical Technicians) Education and training	0.5	2.5
8.11 Advanced training in clinical pharmacy	4	4

8.12 Advanced training in drug information	0	3
8.13 Continuing education in medication management	0	3
8.14 Congress contributions and journal articles	2	3
8.15 Others	4	4
9 Quality assurance		
9.1 Critical Incident reporting System (CIRS)		
9.1.1 The hospital has established a CIRS	4	4
9.1.2 Permanent member of the analysis team	3.5	4
9.1.3 If required, CIRS processing in the analysis team	4	4
9.1.4 Medication errors recorded and evaluated	4	4
9.2 Interlaboratory tests AM-Info/Clinical-pharmaceutical services		
9.2.1 Round robin tests within the pharmacy	4	3.5
9.2.2 Internal round robin tests in German Armed Forces Hospital pharmacies	0	3
9.2.3 Proficiency tests	4	4
9.3 Proficiency tests TDM		
9.3.1 Proficiency tests TDM within the pharmacy	0	3.5
9.3.2 Interlaboratory comparisons TDM internal German Armed Forces Hospital pharmacies	0	2
9.3.3 External proficiency testing TDM	2	3.5
9.4 Introduction of standards and clinical pathways	1.5	3
9.5 Pilot function	0	3
9.6 Additional charges / new examination and treatment methods	2	3
9.7 Implementation of a quality management system (QMS)		
9.7.1Clinical-pharmaceutical services in QMS Pharmacy	4	4
9.7.2 Clinical-pharmaceutical services in the hospital QMS	3.5	3.5
9.8 Others	0	4
10 Others		
10.1 Pharmacy management system	4	4
10.2 Clinical Pharmacy Consultative Group	Not specified	4
10.3 External committee work	4	4
10.4 Release prescription of reserve antibiotics	4	4
10.5 Release of discharge medication	4	4